



CLAIM AMENDMENTS

1 (Currently Amended)

A reinforced plastic composite pressure vessel for containment of fluids which may be under pressure, said pressure vessel comprising:

- a) a pair of shell sections made from a reinforced plastic composite material with each having a cylindrical side wall and one end wall thereon along with an open opposite end;
- b) a reinforcing region adjacent to and surrounding the open end of each of said shell sections and which reinforcing regions cooperate to enable said shell sections to be joined together ~~and thereby form a unitary reinforced plastic composite pressure vessel,~~ said reinforcing regions having tapered bonding surfaces;
- c) said shell sections having opposing and matching ends in proximity of the reinforcing regions and which matching ends are adapted to be abutted together to form a complete shell; and
- d) a joinder ring ~~fitted~~ located within the ~~open ends~~ interior of ~~each of~~ said shell sections when said shell sections are brought together in abutting relationship and which joinder ring engages has tapered edge portions which engage and are physically bonded to the tapered

bonding surfaces in each of the reinforcing regions at the open ends of each of said shell sections and thereby ~~allows~~ provides for complete fluid tight sealing attachment of the two shell sections together to form said reinforced plastic composite pressure vessel.

2 (Original)

The reinforced plastic composite vessel for containment of fluids of Claim 1 further characterized in that said shell sections together comprise an inner shell wall of the vessel and that an outer shell wall is disposed about said inner shell wall and is secured thereto.

3 (Currently Amended)

The reinforced plastic composite vessel for containment of fluids of Claim ~~3~~ 2 further characterized in that said outer shell wall is formed by applying of filament containing reinforcing material about said inner shell.

4 (Currently Amended)

The reinforced plastic composite vessel for containment of fluids of Claim 1 further characterized in that said joinder ring has surfaces which match and engage surfaces of said reinforcing

regions and enable said shell sections to be joined together to thereby form said pressure vessel.

5 (Currently Amended)

The reinforced plastic composite vessel for containment of fluids of Claim 1 further characterized in that said reinforcing regions in each of said shell sections ~~have~~ are adhesively bonded to the tapered surfaces ~~and of the joinder ring has similarly, and the~~ tapered surfaces of the joinder ring which match and engage the tapered surfaces of each of said shell sections and lie in close fitting contact therewith when the two shell sections are brought together and bonded in abutting engagement.

6 (Currently Amended)

The reinforced plastic composite vessel for containment of fluids of Claim ~~4~~5 further characterized in that said joinder ring is formed of a reinforced plastic composite material.

7 (Original)

The reinforced plastic composite vessel for containment of fluids of Claim 3 further characterized in that said outer shell is integrally bound to said inner shell.

8 (Currently Amended)

A relatively low weight and high performance, liner-less pressure vessel capable of retaining fluid under pressure in adverse environmental conditions, said vessel comprising:

- a) a preformed unitary vessel having a side wall and end members integral therewith to thereby form an interior chamber, and which vessel ~~is divided into~~ was initially formed by a pair of separate and engageable vessel shell sections which were brought together to form an extra shell with an interior component;
- b) end fittings cured to interior surfaces of the end members of said vessel and being integral therewith;
- c) a joinder ring located within ~~each of an interior compartment formed by~~ said shell sections when brought together and being secured to edges of said shell sections to form a complete unitary vessel.

9 (Currently Amended)

The relatively low weight, high performance and liner-less pressure vessel of Claim 8 further characterized in that said shell sections each comprise a cylindrical reinforcing ring section at the open ends of the said shell sections and having mating surfaces thereon; and said joinder ring also having mating surfaces which match the mating surfaces of said reinforcing ~~rings~~ sections.

10 (Currently Amended)

The relatively low weight, high performance and liner-less pressure vessel of Claim 8 further characterized in that said vessel ~~has~~ is comprised of an outer shell which is secured to and disposed ~~thereabout~~ about and completely encloses ~~same~~ an inner liner for the full length of the side wall thereto.

11 (Currently Amended)

The relatively low weight, high performance and liner-less pressure vessel of Claim 10 further characterized in that said outer shell is filament wound on the inner wall of the vessel side wall and ~~secured thereto~~ and becomes integral therewith.

A high performance liner-less pressure vessel formed primarily of fiber reinforced plastic composite material and comprising:

- a) a fully cured filament wound reinforced plastic composite inner shell formed of a relatively minimal thickness but of a thickness sufficient to carry a portion of an induced pressure load in said vessel;
- b) a filament wound reinforced plastic composite outer shell in which ~~is filament wound~~ filament material is located around said inner shell and completely covers said inner shell, said outer shell having a thickness to carry a substantial portion of any induced pressure load;
- c) said inner shell being fully bonded to said outer shell forming a composite pressure vessel shell ~~composite~~ with a cylindrical side wall and end walls thereon and divided into a pair of shell sections which cooperate together to form a complete composite inner pressure vessel shell;
- d) reinforcing regions at the inner opposed ends of said shell sections and having tapered bonding surfaces;
- e) said shell sections having opposing and matching ends in proximity of the reinforcing regions and which matching ends are adapted to be abutted together to form a complete inner shell;

f) a joinder ring located within the interior of said shell sections when said shell sections are brought together in abutting relationship and which joinder ring has tapered edge portions which engage and are physically bonded to the tapered bonding surfaces in each of the reinforcing regions at the open ends of each of said shell sections and thereby provides for complete fluid tight sealing attachment of two shell sections together;

~~d)g)~~ an open port formed in each of said end walls; and

~~e)h)~~ end fittings secured to the interior and exterior of said composite pressure vessel shell and extending outwardly therefrom, said end fittings being completely sealed against the interior surface of said inner shell in regions surrounding the ports at said end walls.

13 (Canceled)

14 (Currently Amended)

The high performance liner-less pressure vessel formed primarily of fiber reinforced plastic composite material of Claim ~~13~~ 12 further characterized in that said inner shell is integrally bonded to said outer shell and together form a unitary shell.

15 (Original)

The high performance liner-less pressure vessel formed primarily of fiber reinforced plastic composite material of Claim ~~13~~ 12 further characterized in that a barrier film is secured to and substantially covers the full inner surface of the inner shell.

16 (Currently Amended)

The high performance liner-less pressure vessel formed primarily of fiber reinforced plastic composite material of Claim ~~13~~ 12 further characterized in that said cylindrical side wall has a ~~split~~ slit line on the interior thereof.



17 (Withdrawn)

A method of making a liner-less reinforced plastic composite pressure vessel, said method comprising:

- a) forming a reinforced plastic composite inner shell of said vessel and which is comprised of a side wall and a pair of end domes;
- b) separating said inner shell into a pair of shell sections;
- c) installing interior components in said shell sections;
- d) rejoining said shell sections at the region of separation to form a unitary inner shell; and
- e) producing an outer shell about said inner shell and which outer shell constitutes a load bearing shell.

18 (Withdrawn)

The method of making a liner-less reinforced plastic composite pressure vessel of Claim 17 further characterized in that said method comprises winding fiber containing reinforcing material about said inner shell in order to produce said outer shell thereon.

19 (Withdrawn)

The method of making a liner-less reinforced plastic composite pressure vessel of Claim 17 further characterized in that said

method comprises joining said shell sections together with a joinder ring therefor.

20 (Withdrawn)

The method of making a liner-less reinforced plastic composite pressure vessel of Claim 17 further characterized in that said shell sections have inner surfaces adapted to match the joinder ring and which allows the joinder ring to become permanently bonded to each of the shell sections.

21 (Withdrawn)

The method of making a liner-less reinforced plastic composite pressure vessel of Claim 17 further characterized in that the method comprises installing a barrier film around the interior surface of said inner shell.

22 (Withdrawn)

The method of making a liner-less reinforced plastic composite pressure vessel of Claim 17 further characterized in that said method comprises installing end fittings on each of said end walls from the interior of said inner shell, and which become permanently bonded to said inner shell.

The method of making a liner-less reinforced plastic composite pressure vessel of Claim 17 further characterized in that an outer shell is wound about said inner shell and completely covers and encloses said inner shell, said outer shell carrying a substantial portion of any pressure load from containment of fluid therein.

24 (Withdrawn)

A method of making a liner-less reinforced plastic composite pressure vessel, said method comprising:

- a) forming a reinforced plastic composite inner shell of said vessel and which is comprised of a side wall and a pair of end walls;
- b) separating said inner shell into a pair of shell sections, with each being an open end opposite the end wall of that section;
- c) providing a joinder ring at the interior surface of each of said shell sections when abutted together at the open ends thereof and which allows for securement of the said shell sections together to thereby form a unitary vessel, said joinder ring having surfaces which mate with surfaces on said shell sections adjacent the open ends; and
- d) permanently bonding said ring to said shell sections to thereby form a unitary shell.

25 (Withdrawn)

A method of making a liner-less reinforced plastic composite pressure vessel of Claim 24 further characterized in that the step of bonding the joinder ring to the two shell sections comprises

joining of tapered edges on said ring to tapered reinforcing areas adjacent the open ends of said shell sections.

26 (Withdrawn)

A method of making a liner-less reinforced plastic composite pressure vessel of Claim 24 further characterized in that said method comprises causing the joinder ring and the two shell sections when assembled together to provide a bonded reinforced plastic composite structure.

27 (Withdrawn)

A method of making a liner-less reinforced plastic composite pressure vessel of Claim 24 further characterized in that said method comprises installing certain vessel components in the interior of said vessel before joining the two shell sections together.

28 (Withdrawn)

A method of making a liner-less reinforced plastic composite pressure vessel adapted for high altitude or outer space use of Claim 24 further characterized in that said method comprises over wrapping said assembled unitary shell with additional reinforced plastic composite material.

A reinforced plastic composite pressure vessel for containment of fluids which may be under pressure, said pressure vessel comprising:

- a) a pair of shell sections made from reinforced plastic composite material with each having a cylindrical side wall and end walls thereon;
- b) a reinforcing region adjacent to and surrounding the open end of each of said shell sections and which reinforcing regions cooperate to enable said sections to be joined together and thereby form a unitary reinforced plastic composite pressure vessel;
- c) said shell sections each having an inner shell element formed of a relatively minimal thickness but sufficient to carry a portion of an induced pressure load and an outer shell element having a thickness to carry a substantial portion of any induced pressure load;
- d) said shell sections having opposing matching edges which are adapted to be abutted together to form a complete shell with said inner shell element being fully bonded to said outer shell element and forming a composite pressure vessel having shell

~~composite with they~~ the cylindrical side wall and the ~~open~~ end walls;

- e) an open port formed in each of said end walls;
- f) a joinder ring fitted within the open ends of each of said shell sections and when when said shell sections are brought together in abutting relationship, ~~and which~~ the ring engages the reinforcing regions at the open ends of each of said shell sections thereby allowing for complete sealing attachment of the two shell sections together; and
- g) end fittings secured to the interior and exterior of the composite ~~shell~~ pressure vessel and extending outwardly therefrom, said end fittings being completely sealed against the interior surface of said inner shell element in regions surrounding the ports at said end walls.